Co-Chairs:
Rep. Dell Raybould
Senator Laird Noh

Natural Resources Interim Committee
Legislative Services Office
State Capitol
P.O. Box 83720
Boise, Idaho 83720-0054
Fax: (208) 334-2125
E-mail: water@lso.state.id.us

NATURAL RESOURCES INTERIM COMMITTEE
TREASURE VALLEY AQUIFER WORKING GROUP

The Treasure Valley Aquifer Working Group
Is Comprised of (List Senators and Representatives)
The Working Group will, in consultation with stakeholders, develop a framework for management of the Treasure Valley Aquifer to Ensure the Long-Term Sustainability of the Surface and Ground Water Supply for all Beneficial Uses in Accordance with the Prior Appropriation Doctrine as Established by Idaho Law.

INTRODUCTION

The Legislature, through House Concurrent Resolution No. 56, directed the Natural Resources Interim Committee to "conduct a study regarding water supply and management issues in the Moscow, Rathdrum Prairie, and Snake Plain Aquifers and the Bear River Drainage." The Natural Resources Interim Committee intends to use the Treasure Valley Working Group to review and formulate a plan for addressing ground water supply and management issues in the Treasure Valley.

THE RESPONSIBILITIES OF THE TREASURE VALLEY AQUIFER WORKING GROUP

The Treasure Valley Aquifer Working Group will make recommendations to the Natural Resources Interim Committee on the following matters:

1) Recommend short-term and long-term management goals and objectives for the Treasure Valley Aquifer together with standards to determine whether the goals and objectives are being met;

2) Investigate and make recommendations regarding water supply measures or projects that should be implemented to achieve the short-term and long-term goals and objectives, including, but not limited to, a proposed recharge plan;

3) Investigate the extent of ground water depletions from the Treasure Valley Aquifer and make recommendations for reducing or curtailing ground water depletions;

4) Study and recommend methods for funding implementation of Treasure Valley Aquifer management goals and objectives;

5) Evaluate and make recommendations regarding an administrative structure for ensuring that short-term and long-term goals and objectives are implemented; and

6) Develop performance benchmarks for implementation of goals and objectives.

OVERVIEW OF TREASURE VALLEY HYDROLOGIC CONDITIONS AND WATER SUPPLY ISSUES

1) Aquifer System Description:

   a) Physical Characteristics

   The Treasure Valley of southwestern Idaho consists of the lower Boise River sub-basin and the area between the lower Boise River sub-basin and the Snake River (Figure 1). The lower Boise River sub-basin begins where the Boise River exits the mountains near Lucky Peak Reservoir. From Lucky Peak Dam, the lower Boise River flows about 64 (river) miles northwestward through the Treasure Valley to its confluence with the Snake River. The Treasure Valley includes the cities of Boise, Nampa, Caldwell, Meridian, Eagle, Kuna, and a number of smaller communities. The central portion of the valley is drained by the Boise River; the southern portion of the area is drained by the Snake River.

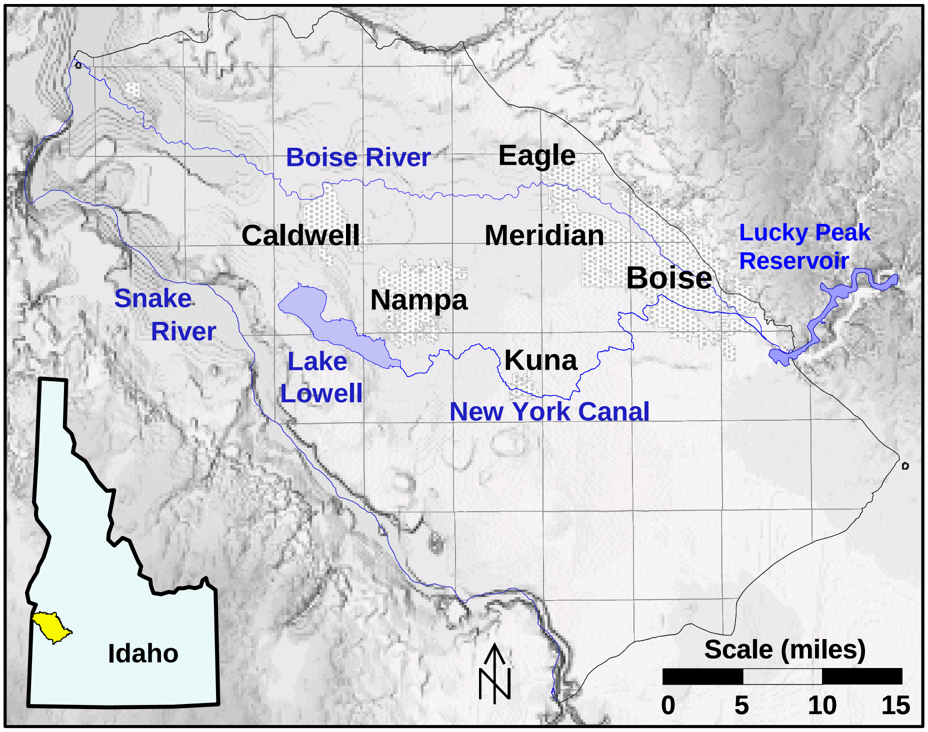

Figure 1: Treasure Valley and surrounding areas.

The Treasure Valley aquifer system consists of a complex series of interbedded, tilted, faulted, and eroded sediments, extending as far as 6,000 feet below ground surface (Wood and Clemens, in press). Ground water flows through these sediments in a series of shallow, local flow systems (with ground water residence times ranging from years to hundreds of years) and a deeper, regional flow system (with residence times ranging from thousands to tens of thousands of years) (Hutchings and Petrich, 2002a). Few water wells extend beyond a depth of 1,200 feet.

The largest component of recharge to shallow aquifers is seepage from the canal system and infiltration associated with irrigated agriculture. Additional recharge sources include mountain front recharge, underflow from the Boise foothills and tributary sedimentary aquifers, and direct precipitation.

Shallow aquifer levels increased by as much as 100 feet in some areas in response to the initiation of large-scale flood irrigation in the late 1800s and early 1900s. Shallow ground-water levels rose to and have remained at (or near) ground surface in many areas (at least seasonally), discharging to drains and other surface channels.

Recharge to the deeper aquifers begins as downward flow through coarse-grained alluvial fan sediments in the eastern portion of the basin and as underflow at basin margins. Ground water then flows horizontally into the basin via permeable sediments.

Ground water residence times in deep aquifers range from hundreds to tens of thousands of years. The youngest waters entered the subsurface a few thousand years ago and are found along the northeastern boundary of the basin adjacent to the Boise Foothills. The oldest waters entered the subsurface between 20,000 and 40,000 years ago and are found in the western reaches of the basin near the Snake River.

Ground water generally flows in a westerly direction (Figure 2). Water table contours in shallow aquifers (Figure 2) reflect surface hydrologic conditions, such as mounding under the New York Canal, or discharge to the Boise River. Ground water contours in deeper zones indicate a more uniform westerly flow direction.

Ground-water levels are relatively stable in some areas, although water level declines have occurred in others (Petrich and Urban, 2004). Wells in two areas, southeast Boise and south of Lake Lowell, have experienced declines of approximately 30 feet and 65 feet, respectively. Water levels in these areas appear to have stabilized in recent years. Additional ground-water level declines have been observed in the areas between northwest Boise and Eagle and southwest Boise, Meridian, and Kuna. Most of the long-term declines in these wells have been less than 10 feet. Reasons for the declines may include increased withdrawals from the measured wells (very few of the monitoring wells are dedicated to monitoring alone), increased nearby withdrawals, and/or changes in local infiltration rates. Shallow wells may be especially sensitive to changes in local surface water irrigation patterns in areas where the water table is not in direct hydraulic connection with surface channels. Ground-water level changes are less likely in shallow wells in areas where the water table is controlled by topography (by virtue of drains and canals).

Seasonal water level fluctuations are evident in many Treasure Valley wells. The fluctuations are generally a response to seasonal increases in withdrawals (e.g., summer irrigation withdrawals) or increases in recharge associated with surface water irrigation.

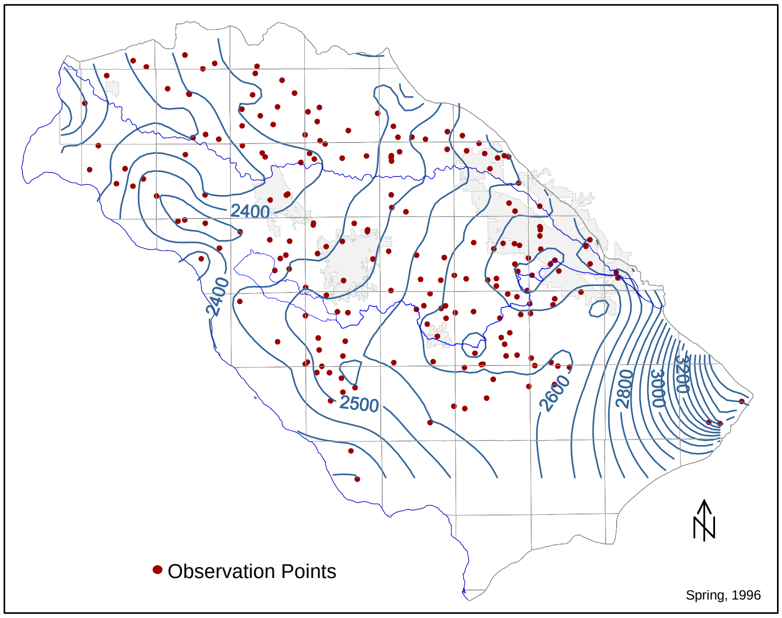

Figure 2: Potentiometric surface based on 1996 water level measurements from wells completed in the uppermost 200 feet of aquifer thickness.

b. Recent Investigations

The Treasure Valley Hydrologic Project, completed earlier this year, focused on developing an improved understanding of ground-water flow in the Treasure Valley. The Idaho Department of Water Resources (IDWR), Idaho Water Resources Research Institute (IWRRI), the U.S. Geological Survey, U.S. Bureau of Reclamation, Boise State University, and other project participants characterized ground water flow in the Treasure Valley aquifer system, evaluated flow system geochemistry, estimated ground-water residence times based on various isotopes, and constructed a numerical model of ground-water flow. The ground-water flow model was used to evaluate potential changes in recharge and predict possible effects of increased withdrawals.

Results from this study indicate that there is sufficient water for a growing population, but water is not always available where and when it is needed. The aquifer is susceptible to water level declines from increased withdrawals, especially in some deeper zones. Simulated ground water flow from shallow to deeper zones is a small portion of the total recharge to deeper aquifers. More extraction from shallow zones is possible in some areas without substantial shallow aquifer declines, although discharge to drains and surface channels would likely decrease, and seepage from surface channels would likely increase. Changes in land use leading to decreased aquifer recharge will likely have a minimal effect on ground water levels in areas where the water table is controlled by drain elevations, unless ground water levels decline below drain elevations. Differences in water characteristics between shallow and deep aquifers underscore the importance of preventing commingling of ground water of shallow and deep zones.

2) Current Problems and Constraints:
There are a number of water issues facing Treasure Valley residents, which can be grouped into two general categories: water supply and water quality. These are outlined below.

a. Water Supply

Water is not always available where and when it is needed. In general, the Treasure Valley has a sufficient supply of water to support the current and anticipated future population. Approximately one million acre-feet of water leaves the valley each year in the form of river flows (including early season runoff) and irrigation-related discharge and return flows (primarily in the western end of the valley). However, the water is not always available where and when it is needed. Water is most fully appropriated in the eastern portion of the valley. There are over 450 unprocessed applications for new water rights pending with IDWR.

Additional storage. Additional water storage may be required to mitigate the temporal differences between when water is available and when it is needed. The storage could include both surface and subsurface storage. Currently only minimal managed subsurface recharge currently occurs, but there are opportunities for increased use of this method of storage.

Local limitations in aquifer capacity. The aquifer system is susceptible to water level declines from increased withdrawals in some areas, especially in some deeper zones. Some municipal suppliers that withdraw ground water are seeking surface-water rights to augment supplies for current and projected demand (especially in the eastern portion of the valley). Simulations indicate that only a small portion of surface recharge reaches deeper aquifer zones.

Water level changes. Ground-water levels are relatively stable in many areas, although water level declines have occurred in others (Petrich and Urban, 2004). Wells in two areas, southeast Boise and south of Lake Lowell, have experienced declines of approximately 30 feet and 65 feet, respectively. Water levels in these areas appear to have stabilized in recent years. Additional ground-water level declines have been observed in the areas between northwest Boise and Eagle and southwest Boise, Meridian, and Kuna). Most of the long-term declines in these wells have been less than 10 feet. Reasons for the declines may include increased withdrawals from the measured wells (very few of the monitoring wells are dedicated to monitoring alone), increased nearby withdrawals, and/or changes in local infiltration volumes. The increases in withdrawals can often be linked with urbanization. Shallow wells may be especially sensitive to changes in local surface water irrigation patterns in areas where the water table is not in direct hydraulic connection with surface channels. Ground-water level changes are less likely in shallow wells in areas where the water table is controlled by topography (by virtue of drains and canals).

Ground and surface water interaction. Recognition of ground- and surface-water interaction has led to an evaluation of conjunctive administration options in the Treasure Valley, especially in the area tributary to the Boise River above Star Bridge. Developing a conjunctive administration strategy in the Treasure Valley will include better definition of impact and injury to senior water right holders, the development of response functions to estimate the general effect of extraction at various depths and distances. Although recognized, the degree of impact or injury does not appear at this time to be as acute as in the Eastern Snake River Plain aquifer.

Computer simulations indicate that more extraction from shallow zones in some areas is possible without substantial shallow aquifer declines. This, however, would likely lead to decreased discharge to drains and surface channels, or increased seepage from surface channels.

Endangered Species Act Concerns. Concerns over lower Snake River flows for salmon and steelhead are influencing water management in the Treasure Valley. Concerns about downstream flows have limited the amount of new water development in the Treasure Valley, and have influenced USBR evaluations of proposed changes in water use (e.g., changes from agricultural to non-agricultural uses).

Concerns about decreased ground water recharge associated with urbanization. Changes in land use leading to decreased (or increased) aquifer recharge will likely have a minimal effect on ground water levels in areas where the water table is controlled by drain elevations, unless ground-water levels decline below drain elevations. However, decreases in ground water recharge in areas where ground-water levels are not controlled by local drains (and/or canals) may lead to local ground-water level declines.

Lack of a fully developed water market. An increasing population and corresponding changes in land use are driving interest in water transfers (which frequently require changes in the nature of water use). Changes in use from agricultural to municipal/commercial often require USBR participation. Providing sufficient water for a changing valley will require a more flexible system for transferring water rights, especially if changes in the type of use are required.

Uncertainty regarding consumptive use changes associated with urbanization. One question frequently raised is whether or not urbanization leads to a decrease or increase in consumptive water use. A detailed study analysis of net changes in water use conducted in the Treasure Valley would help answer these questions.

b. Water Quality

In general, the water quality in Treasure Valley aquifers is relatively good. There are, however, a number of known contamination areas, local water-quality problems associated with both natural and human-caused factors. The following is a general description of the problems:

Contaminated areas. There are a number of known contaminated areas, although these represent a very small portion of the overall aquifer system. There are also elevated levels of nitrate and other constituents; nitrate, as a "conservative tracer" in ground water, is an indicator of water quality vulnerability. Existing contamination with volatile organic compounds (such as perchloroethylene [PERC]) also illustrate the effects of ground water vulnerability. Volatile organic compounds contaminating the aquifer pose substantial constraints to aquifer utilization.

Elevated nitrate concentrations. Several portions of the valley have concentrations of arsenic that exceed U.S Environmental Protection Agency (EPA) standards. Community water systems are facing economic challenges as they strive to meet the EPA standards.

Well Construction Standards. IDWR is currently considering revised well construction standards to help protect against vertical ground water movement between aquifers.

3) Areas of Uncertainty:

The Treasure Valley relies on a very complex, heterogeneous, faulted aquifer system. There is substantial uncertainty about:

a) Aquifer characteristics in numerous areas (especially in areas with few wells).

b) The rate of underflow into the basin.

c) The degree of interaction between cold water aquifers and underlying geothermal aquifers.

d) Response characteristics of ground water extraction on various reaches of the Boise River.

e) The degree to which spatial and temporal ground water characteristics can be simulated.

f) Amounts of water being withdrawn for supplemental uses.

4) Existing/Future Activities & Resources:

IDWR currently is planning the following activities:

a) Refine predictive simulations for exisiting model scenarios (as described in modeling reports).

b) Exercise the existing steady-state IDWR ground-water flow model to evaluate other ground-water development scenarios.

c) Conduct a comparison of water budgets prepared by IDWR and USBR.

d) Re-run steady-state calibrations using revised USBR water budget.

e) Develop initial response functions for the tributary to the Boise River above Star Bridge.

f) Develop a sub-regional ground-water flow model to better focus on issues in the upper Treasure Valley (Lucky Peak to Star Bridge).

g) Refine response functions for the tributary to the Boise River above Star Bridge.

h) Coordinate IDWR studies with Treasure Valley modeling and planning efforts underway by the U.S. Bureau of Reclamation.

Numerous resources represent a basis for continuing efforts to better understand the Treasure Valley hydrologic system.

a) Calibrated regional-scale ground-water flow model capable of predictive analysis.

b) Well-trained, competent GIS staff capable of providing visual products to assist in studying and analyzing issues.

c) Well-trained, competent modelers capable of exercising the model for specific purposes/scenarios.

BIBLIOGRAPHY OF RELEVANT PUBLICATIONS

Further information about the Treasure Valley aquifer system is available in the following reports:

1) Treasure Valley Hydrologic Project Executive Summary (Petrich, 2004).

2) Water Budget for the Treasure Valley Aquifer System, 1996 and 2000 (Urban, 2004).

3) Influence of Canal Seepage on Aquifer Recharge Near the New York Canal (Hutchings and Petrich, 2002).

4) Ground-Water Recharge and Flow in the Regional Treasure Valley Aquifer System (Hutchings and Petrich, 2002).

5) Characterization of Ground-Water Flow in the Lower Boise River Basin (Petrich and Urban, 2004).

6) Characterization of Ground-Water Flow in the Lower Boise River Basin, Appendix C, Monitoring Well Diagrams (Petrich and Urban, 2004).

7) Simulation of Ground-Water Flow in the Lower Boise River Basin (Petrich, 2004).

8) Simulation of Potential Increased Treasure Valley Ground-Water Withdrawals Associated with Unprocessed Well Applications (Petrich, 2004).

9) Geologic and Tectonic History of the Western Snake River Plain, Idaho and Oregon (Wood and Clemens, in press).

10) Hydrogeologic Conditions in the Boise Front Geothermal Aquifer (Petrich, 2003a).

11) Investigation of Hydrogeologic Conditions and Ground Water Flow in the Boise Front Geothermal Aquifer–Executive Summary (Petrich, 2003b).

12) Treasure Valley's Water Future–Summary of the Treasure Valley Water Summit (COMPASS et al., 2002).

13) Developing evapotranspiration data for Idaho's Treasure Valley using Surface Energy Balance Algorithm for Land (SEBAL) Treasure Valley (Kramber, 2002)

14) Stratigraphic Studies of the Boise (Idaho) Aquifer System using Borehole Geophysical logs with Emphasis on Facies Identification of Sand Aquifers (Squires and Wood, 2001)

15) Domestic, Commercial, Municipal, and Industrial Water Demand Assessment and

Forecast in Ada and Canyon Counties, Idaho (Cook et al., 2001).

16) Seismic Reflection Project - UPRR 2000 Profile (Liberty and Wood, 2001).

17) Hydrogeology, Geochemistry, and Well Construction of the Treasure Valley hydrologic Project Monitoring Well #1 (Dittus et al., 1999).

18) 1996 Water Budget for the Treasure Valley Aquifer System (Urban and Petrich, 1998).

19) New York Canal Geologic Cross-Section, Seepage Gain/Loss Data, and Ground Water Hydrographs: Compilation and Findings (Carlson and Petrich, 1998).

20) Seismic Reflection Imaging of a Geothermal Aquifer in an Urban Setting (Liberty, 1998).

21) Structure Contour Map of the Top of the Mudstone Facies, Western Snake Supporting Data for Groundwater Conditions and Aquifer Testing of the Tenmile Ridge Area of South Boise, Ada County, Idaho (Dittus et al., 1998).

22) Ground water quality characterization and initial trend analysis for the Treasure Valley shallow and deep hydrologic subareas (Neely and Crockett, 1998).

23) Structure Contour map of the Top of the Mudstone Facies, Western Snake River Plain, Idaho (Wood, 1997c).

24) Cross Section of the Treasure Valley in the Boise Area: Notes on the Geology of the Boise, Ontario, Parma, and Notus areas (Beukelman, 1997a; Beukelman, 1997b; Beukelman, 1997c; Beukelman, 1997d).

25) Preliminary Map of the Base of the Sedimentary Section of the Western Snake River Plain (Wood, 1996b).